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| EXAMINER |
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BAREFORD, KATHERINE A

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| ART UNIT | PAPER NUMBER |
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1762

DATE MAILED: 10/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/714,213

Applicant(s)

RIGNEY ET AL.

Examiner

Katherine A. Bareford

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Claim 3 is canceled

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

So

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 6, 2005 has been entered.

As per the request of the RCE submission of September 6, 2005, the previously unentered After Final amendment of August 11, 1005 has been entered. With the entry of that amendment, claims 3 has been canceled, and claims 1-2 and 4-19 are pending for examination.

Terminal Disclaimer

2. The terminal disclaimer filed on August 11, 2005 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US application 10/714,430 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Double Patenting

3. The provisional rejection of claims 1-4, 7-8 and 11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4, 7-8 and 11 of copending Application No. 10/714,430 is withdrawn due to the filing of an acceptable terminal disclaimer on August 11, 2005 as discussed in the *Terminal Disclaimer* section above.

Claim Rejections - 35 USC § 112

4. The rejection of claim 12 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention is withdrawn due to the amendment of August 11, 2005 to claim 12 clarifying what "M" can be.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under

37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-2 and 4-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Draghi et al (US 5972424) in view of Arnold (US 6049978), Beverly et al (US 6074706) and Blecherman et al (US 3570449).

Claim 1: Draghi teaches, in the Background Art section, a conventional method of repairing a coated component that has been exposed to engine operation. Column 1, line 10 through column 2, line 20. An engine run component with a base metal substrate is provided. Column 1, lines 40-65. The component has a thermal barrier coating system comprising a bond coat on the base metal and a top ceramic thermal barrier coating. Column 1, lines 30-40. The applied ceramic coating would have a thickness, which can be considered "t". Draghi teaches to remove the thermal barrier coating system. Column 1, lines 45-65. In the removal, a portion of the base metal substrate is also removed, indicating the complete removal of the thermal barrier coating system. Column 1, lines 55-65. This removed amount would have a thickness, which can be considered " Δt ". The substrate, with the coating removed, is inspected to see if recoating is acceptable. Column 1, lines 60-65. If so, a bond coat is reapplied to the substrate as part of the repair. Column 2, lines 1-20. Then a top ceramic coating is applied to the bond coat. Column 2, lines 10-20. Following repair, the parts are

inspected again to determine if they are acceptable to return to service. Column 2, lines 10-20.

Claim 2: the component can be a high pressure turbine blade. Column 1, lines 10-30.

Claim 5: the bond coats can be diffusion aluminide. Column 1, lines 25-30 and column 5, line 60 through column 6, line 5.

Claim 6: Draghi indicates that when using diffusion aluminide bond coatings, they can be simple aluminide or modified aluminide. Column 5, line 60 through column 6, line 5.

Claims 7-8: Draghi indicates the base metal of such components can be a nickel based superalloy. See column 5, lines 10-20.

Claim 9: Draghi indicates that when using diffusion aluminide bond coatings, they can be modified with noble metals, which would include Pt and Pd. Column 5, lines 60 through column 6, line 5.

Claim 10: Draghi teaches that the bond coat can contain M Cr Al Y and diffusion aluminide and other elements such as Si, Hf, Ta and Re. Column 6, lines 1-10.

Claim 11: Draghi indicates that the ceramic thermal barrier coating can be yttria stabilized zirconia. Column 7, lines 20-30.

Claim 12: Draghi indicates that the bond coat can be M Cr Al Y. Column 1, lines 25-30 and column 5, line 60 through column 6, line 5.

Claims 13 and 19: Draghi provides a process as discussed with regard to claim 1 above. Furthermore, the substrate can be a high pressure turbine blade. Column 1, lines 10-30. The substrate of such blades can be nickel based alloy. Column 5, lines 10-20. The bond coating can be a diffusion bond coat. Column 1, lines 25-30 and column 5, line 60 through column 6, line 5. The ceramic top coat can be yttria stabilized zirconia. Column 7, lines 20-30.

Claims 16-18: the component can be an airfoil (turbine blade) or static component, such as a turbine vane. Column 1, lines 25-30.

Draghi teaches all the features of these claims except (1) the precise thickness of the reapplied coatings, (2) the restored conditions (claim 2), (3) the weighing, (4) the bond coat thickness and Δt (claim 4), (5) superalloy features (claims 7,8), (6) the densities (claims 14, 15).

However, Arnold teaches that when repairing turbine engine parts, one must clearly determine the dimensional difference between pre-repaired dimensions and the desired post-repair dimensions. Figure 1(a) and column 14, lines 5-15. One must determine a buildup thickness of coating material required to obtain the desired post repair dimensions. Figure 1(a) and column 14, lines 10-15. Prior to determining the pre-repaired dimensions, a previously applied protective coating must be removed. Figure 1(a) and column 14, lines 30-40. Multiple layers of coating can be applied, taking into account the desired post-repair dimensions. Column 14, lines 30-40. The part can be a nickel based superalloy. Column 14, lines 50-60.

Beverley teaches a method of applying thermal barrier coatings to turbine components. Column 1, lines 5-10. The substrate can be a nickel based superalloy. Column 1, lines 15-25. The substrate can be single crystal or directionally solidified. Column 1, lines 15-25. A bond coat is applied to the substrate. Column 4, lines 1-10. The bond coat can be diffusion aluminide or M Cr Al Y alloys. Column 4, lines 5-10. A ceramic top layer is applied over the bond layer on the substrate. Column 4, lines 1-15. The ceramic can be yttria stabilized zirconia. Column 4, lines 5-15. The bond coat is applied in a uniform fashion to a thickness of 0.001 to about 0.005 inch (1 to 5 mils). Column 5, lines 1-15. As is shown by figure 2, the bond coat is applied in a uniform fashion, while the ceramic coat can have varying thicknesses, due to the groove in the substrate. See figure 2 and column 5, lines 1-15.

Blecherman teaches coating an article, such as a turbine vane (blade). Column 2, lines 1-10. Blecherman teaches that the amount of coating thickness deposited on a substrate can be determined by simply weighing before and after exposure to the vapor cloud (the coating material). Column 2, lines 10-15. Blecherman further teaches that it is desirable to be able to continuously monitor, and hence, determine the weight accumulations on the substrate. Column 2, lines 10-15.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Draghi to perform inspections and measurements to determine how much coating materials need to be applied to the substrate to achieve the desired post repair dimensions from the time of removal of the coating and part of

the substrate as suggested by Arnold so as to provide a desirable repaired part, because Draghi teaches to perform inspections after coating removal and following repair to determine if the parts are acceptable to return to service and Arnold teaches the importance of performing inspections and measurements to determine how much coating materials need to be applied to the substrate to achieve the desired post repair dimensions from the time of removal of the coating and part of the substrate to the time coating application has occurred. It would have been suggested that the post repair dimensions should be about the same as the original dimensions of the turbine component, since the part is to be returned to the service for which it would originally used. It would further have been obvious to modify Draghi in view of Arnold to provide the bond coat thickness about the same as the thickness previously applied and the ceramic coat to be applied to a thickness of $t + \Delta t$ as suggested Beverley so as to provide a component of original dimensions, thus restoring adjacent airfoil to airfoil throat distance to the original dimensions, and to provide the new thermal barrier coating of a greater thickness than the original thermal barrier coating, because Draghi in view of Arnold teach removal of coating, repair and inspection and reapplication of coating to provide a part of original dimensions, and Beverley teaches that it is desired for bond coats to be applied in a narrow range of thicknesses and the top ceramic coat, on the other hand, can be provided at a variety of thicknesses. It would further have been obvious to modify Draghi in view of Arnold and Beverley to weigh the component at various points in the process, including before coating begins, after application of the

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bond coating and after coating of the thermal barrier coating in order to determine the thickness of the coating, as suggested by Blecherman, because Draghi in view of Arnold and Beverley teach a process of removal of coating, repair and inspection, and reapplication of coating to a desired thickness, and Blecherman teaches that when applying a coating to a turbine blade, the thickness of the coating can be determined by weighing before and after coating, and that further weighing can be performed in process (which would provided in process thickness determinations). This would provide, at the least, measuring w_0 and w_1 (to determine initial coating thickness) and w_2 , w_3 , w_4 , and w_5 (to determine the repaired thickness) and using various combinations to determine the thickness. When calculating w_5 , it would inherently be greater than w_1 due to the greater thickness of the newly applied thermal barrier coating, and lesser thickness of the turbine substrate. As to the specific Δt used, it would be a matter of routine experimentation to optimize the thickness to be removed, based on the desired amount that optimizes removal of the top coatings. As to the use of the specific bond coating thicknesses and specific superalloy, Beverley teaches that a 5 mil bond thickness and single crystal or directionally solidified substrate are desirable features to use when providing turbine components with thermal barrier coatings. As to the densities, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the references to optimize the densities of the materials, given that the references teach the use of the nickel based superalloy and the yttria stabilized zirconia and that Draghi teaches that various application methods can

be used to give the desirable porosity of coating (column 7, line 65 through column 8, line 5) and Arnold teaches that various pressure treatments can be applied to the substrate.

Response to Arguments

8. Applicant's arguments with respect to claims 1-2 and 4-19 have been considered but are moot in view of the new ground(s) of rejection.

The Examiner has provided the reference to Blecherman as to using weight to determine thickness.

As to the restoration taught by Draghi as being to "desirable conditions", it is the Examiner's position that one of ordinary skill in the art would understand "restore" as given its generally understood meaning of "to bring back or put back into a former or original state". Thus, when one of ordinary skill in the art reads of "restoring" an article, one would understand repairing to like new conditions, and the use of original dimensions would clearly be contemplated. While applicant's statement of the "conventional repair process" may indicate that original dimensions are not restored, this statement does not indicate that the teaching of Draghi is specifically being described. The mere statement of applicant's understanding of the state of the art does not mean that this is entirely encompassing of the actual state of the art. As to the argument that Arnold provides excess material that is ground back, unlike applicant, the Examiner notes that this is not prevented by the claims. Also the Examiner notes

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Blecherman, as to providing an in-process weight determination to allow for desired coating thickness.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) with the First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and for After Final communications.

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


KATHERINE BAREFORD
PRIMARY EXAMINER